CLAIMS

What is claimed is:

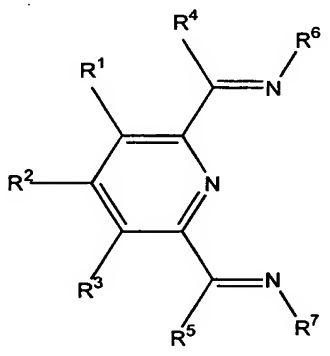
1. A process for preparing an olefin copolymer, comprising the step of contacting:

(a) a monomer component comprising ethylene and a diene of the formula $H_2C=CH(CH_2)_nCH=CHR^{19}$, wherein R^{19} is hydrogen or an n-alkyl containing 1 to 18 carbon atoms, and n is 0 or an integer of 1 to 28; and

(b) an active copolymerization catalyst,

under conditions to copolymerize the monomers of the monomer component, wherein the active copolymerization catalyst comprises an iron complex of a 2,6-pyridinecarboxaldehyde-bis(imine) or a 2,6-diacylpyridinebis(imine).

2. The process as recited in claim 1, wherein the active copolymerization catalyst comprises an iron complex of a tridentate ligand of the formula (I)



(I)

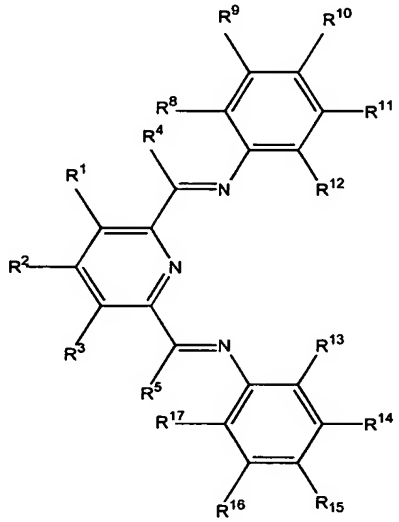
wherein:

R^1, R^2, R^3, R^4 and R^5 are each independently hydrogen, hydrocarbyl, substituted hydrocarbyl or an inert functional group, provided that any two of R^1, R^2 and R^3 vicinal to one another, taken together may form a ring; and

R^6 and R^7 are each independently aryl or substituted aryl.

3. The process as recited in claim 1, wherein the monomer component further comprises one or more α-olefins of the formula $H_2C=CHR^{20}$, wherein R^{20} is n-alkyl containing 1 to 18 carbon atoms.

4. The process as recited in claim 1 wherein the active catalyst is an iron complex of a tridentate ligand of the formula (VII)



(VII)

wherein:

R^9, R^{10}, R^{11}, R^{14}, R^{15} and R^{16} is each independently halogen, alkyl containing 1 to 6 carbon atoms, or hydrogen;

R^8 and R^{13} is each independently halogen, phenyl or alkyl containing 1 to 6 carbon atoms; and

R^{12} and R^{17} is each independently halogen, phenyl, hydrogen, or alkyl containing 1 to 6 carbon atoms.

5. The process as recited in claim 1, wherein n is 1, 2, 3, 4 or 6.

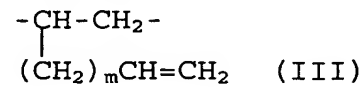
6. The process as recited in claim 5, wherein n is 1, 2, 3 or 4.

7. The process as recited in claim 1, wherein R^{19} is hydrogen or methyl.

8. An olefin copolymer comprising the repeat units:

(a) $-CH_2CH_2-$ (II);

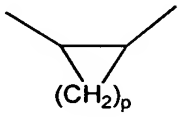
(b)



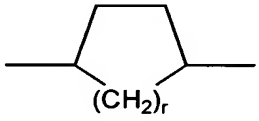
(III)

wherein m is 1, 2, 3 or 4; and

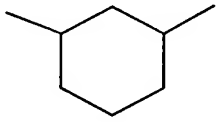
(c) (1) when m is 2, 3 or 4, one or more of



(IV),



(V), and



(XIII); and

(2) when m is 1, one or more of (V) and (XIII);

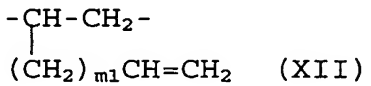
wherein:

p is equal to m; and

r is equal to one or more of m-1, m, and m+1.

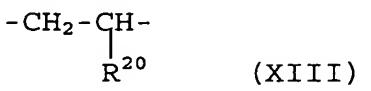
9. The olefin copolymer as recited in claim 8, which is derived from the polymerization of a monomer component comprising ethylene and one or more dienes of the formula $H_2C=CH(CH_2)_nCH=CHR^{19}$, wherein R^{19} is hydrogen or methyl, and n is 1, 2, 3 or 4.

10. The olefin copolymer as recited in claim 8, further comprising one or both of the repeat units



(XII)

and



(XIII)

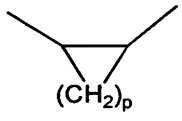
wherein m1 is 0 or an integer of from 5 to 28, and R^{20} is an n-alkyl containing 1 to 18 carbon atoms.

11. The polymer as recited in claim 8, which is substantially non-crosslinked.

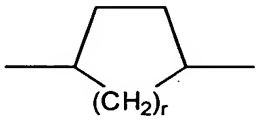
12. A substantially non-crosslinked copolymer of ethylene and a diene of the formula $H_2C=CH(CH_2)_nCH=CHR^{19}$, wherein R^{19} is hydrogen or an n-alkyl containing 1 to 18 carbon atoms, and n is 0 or an integer of 1 to 28, containing residual unsaturation derived from the diene monomer.

13. The copolymer as recited in claim 12, wherein R^{19} is hydrogen.

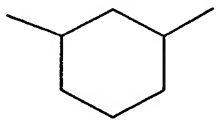
14. The copolymer as recited in claim 12, containing one or more of the repeat units



(IV),



(V), and



(XIII)

wherein p is 2, 3 or 4; and r is 0, 1, 2, 3, 4, or 5.